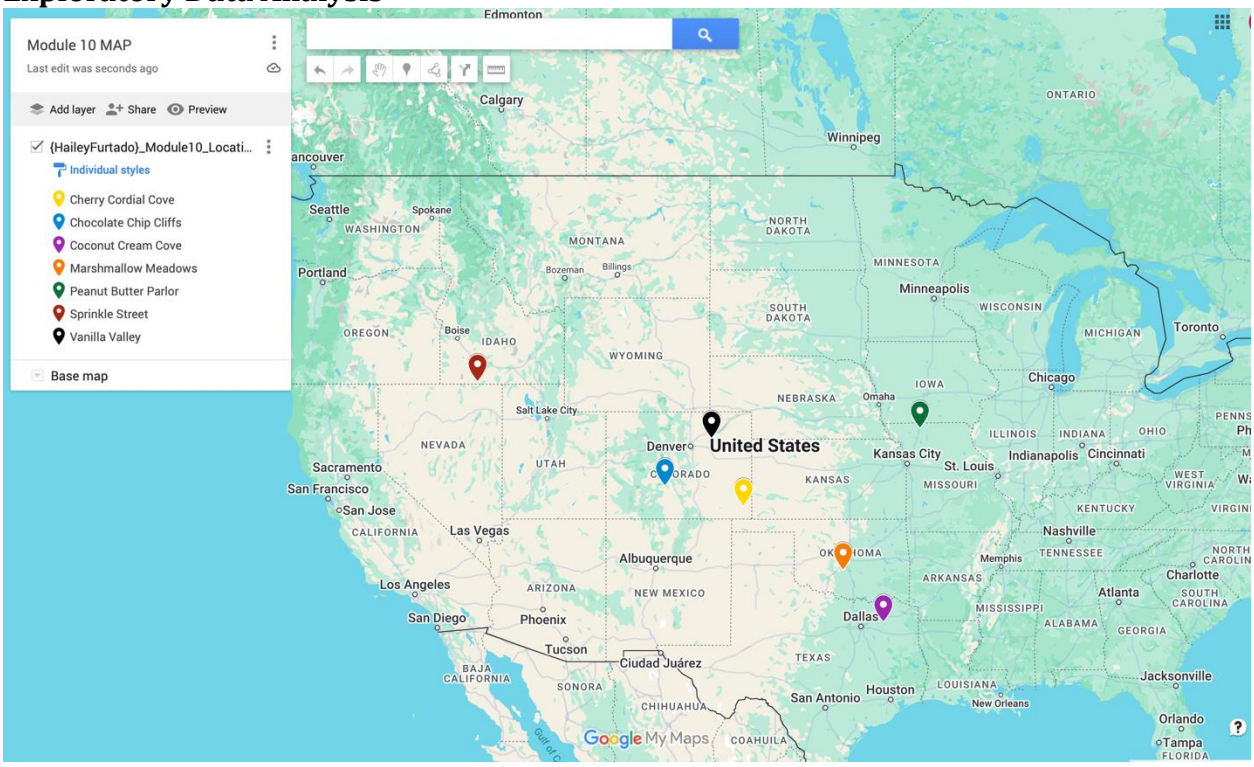
Module 10 – MOLP

Exploratory Data Analysis



Model Optimized for Equally Weighted Objectives

Ship	from	to	cost_per_unit_shipped	Eulidean Distance	Total distance	transportation_method	Eco Binary	Congestion Level	Congestion Binary
0	1	2	6	3.847830558	0	Cargo Ships (Heavy Fuel Oil)	1	97	1
0	1	4	21	5.393662948	0	Cargo Ships (Heavy Fuel Oil)	1	73	1
0	1	5	22	8.981369606	0	Air Freight	1	92	1
0	1	6	19	13.57324206	0	Electric/Hybrid Trucks	0	93	1
0	1	7	18	2.978942765	0	Wind-powered Ships	0	35	0
1951	2	5	22	12.44882324	42922	Electric/Hybrid Trucks	0	29	0
0	2	6	5	9.781048001	0	Cargo Ships (Heavy Fuel Oil)	1	86	1
6453.149788	3	1	7	8.12645064	45172.04851	Cargo Ships (Heavy Fuel Oil)	1	27	0
0	3	2	21	11.77523673	0	Diesel Trucks	1	99	1
0	3	4	18	2.844292531	0	Electrified Rail	0	82	1
0	3	6	9	21.54483001	0	Air Freight	1	80	1
2279.850212	4	1	15	5.393662948	34197.75319	Diesel Rail	1	109	1
0	4	3	15	2.844292531	0	Cargo Ships (Heavy Fuel Oil)	1	29	0
0	4	5	22	6.532090018	0	Diesel Rail	1	28	0
0	4	6	18	18.93537694	0	Air Freight	1	89	1
4888.149788	5	3	14	7.672248693	68434.09703	Cargo Ships (Heavy Fuel Oil)	1	82	1
428.8502124	5	4	22	6.532090018	9434.704672	Electric/Hybrid Trucks	0	92	1
0	6	4	14	18.93537694	0	Air Freight	1	71	1
1411	6	5	7	21.32548944	9877	Diesel Rail	1	29	0
1256	7	1	12	2.978942765	15072	Diesel Rail	1	33	0
0	7	2	11	2.853296339	0	Diesel Trucks	1	29	0
0	7	3	14	10.90075685	0	Electric/Hybrid Trucks	0	102	1
0	7	4	16	8.080575475	0	Wind-powered Ships	0	21	0
0	7	6	14	11.41557708	0	Cargo Ships (Heavy Fuel Oil)	1	77	1

	Nodes	Inflow	Outflow	Netflow	Supply Demand
1	Cherry Cordial Cove	0	9989	-9989	-9989
2	Chocolate Chip Cliffs	1951	0	1951	1951
3	Coconut Cream Cove	6453.149788	4888.149788	1565	1565
4	Marshmallow Meadows	2279.850212	428.8502124	1851	1851
5	Peanut Butter Parlor	5317	3362	1955	1955
6	Sprinkle Street	1411	0	1411	1411
7	Vanilla Valley	1256	0	1256	1256

Minmize transportation	$ 225,109.60
Miminize distance	$ 163,161.81
Maximize eco-friendliness	18685
Minmize Congestion	7596.850212

	totals	target value	Deviation	% devation	weight	weighted devations
Trasnportation	225109.603	198738	$ 26,371.60	13%	1	13%
Distance	163161.808	131641.038	$ 31,520.77	24%	1	24%
Eco-Friendliness	16288.1498	11400	$ 4,888.15	43%	1	43%
Congestion	7596.85021	5317	$ 2,279.85	43%	1	43%
	MinMax	0.428785069				

Above is the minimized cost when considering all the weights and importance's of the transportation, distance, eco-friendliness, and congestion. To reach the target values, the deviation percentages are important. This is the solution to this situation.

Model with Stipulation

	totals	target value	Deviation	% devation	weight	weighted devations
Trasnportation	219347.3031	198738	$ 20,609.30	10%	10	104%
Distance	146971.8046	131641.038	$ 15,330.77	12%	5	58%
Eco-Friendliness	15340.63299	11400	$ 3,940.63	35%	3	104%
Congestion	8648.265974	5317	$ 3,331.27	63%	1	63%
	MinMax	1.037008681				

When using different weights, we can see that the MinMax increases. This can be very useful for scenario planning because in different scenarios different aspects such as transportation, distance, eco-friendliness, and congestion will be more important for planning projects and transportation. Being able to weight each aspect differently will be

crucial to making decisions. For example, if transportation is more important, we will weigh it higher.